Methods for Setting GHG Reduction Targets for Land Use and Transportation under SB 375

Topics

- Roles of BMPs and Models
- Blueprints as a Basis for Setting Targets
- Accounting for Regional Differences
- Equity and Degrees of Difficulty
- Remaining Questions

Respective Roles of BMPs and Models in Evaluating GHG Reduction Strategies

- Roles of BMPs and Models
- Blueprints as a Basis for Setting Targets
- Accounting for Regional Differences
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- Remaining Questions

SB375 Target Setting and Modeling Objectives

- Aggressively achievable regional targets that add up
- Apply targets on pro-rata basis
- Avoid penalizing early achievers

- Accountability
  - Verifiable performance (modeling or performance checklist?)
  - Accurate, consistent modeling at earliest possible date
  - Standard, realistic assumptions on fuel price, vehicle performance
  - Scalable to local level

- Allow fast-growing MPOs to get on course:
  - Assist in developing advanced capabilities
  - Coordinate with other reporting responsibilities

Advantages of BMP Approach

- Understandable to non-technical audiences
- Uniform (but not tailored) assumptions from one application to the next
- Allows selection of a strategy package by inspection
- Available in short-term
- Applications easy to check and verify

Why Enhanced Models Are Needed – Part 1

- Regional variations
  - Different growth rates
  - Jobs rich vs housing rich regions
  - Household size
  - Price sensitivities
  - Critical mass of transit or other prerequisites
- Complex interactions among land use and transportation measures
- Factors critical to GHG estimation: trips, lengths, speeds
- Evaluation of induced travel

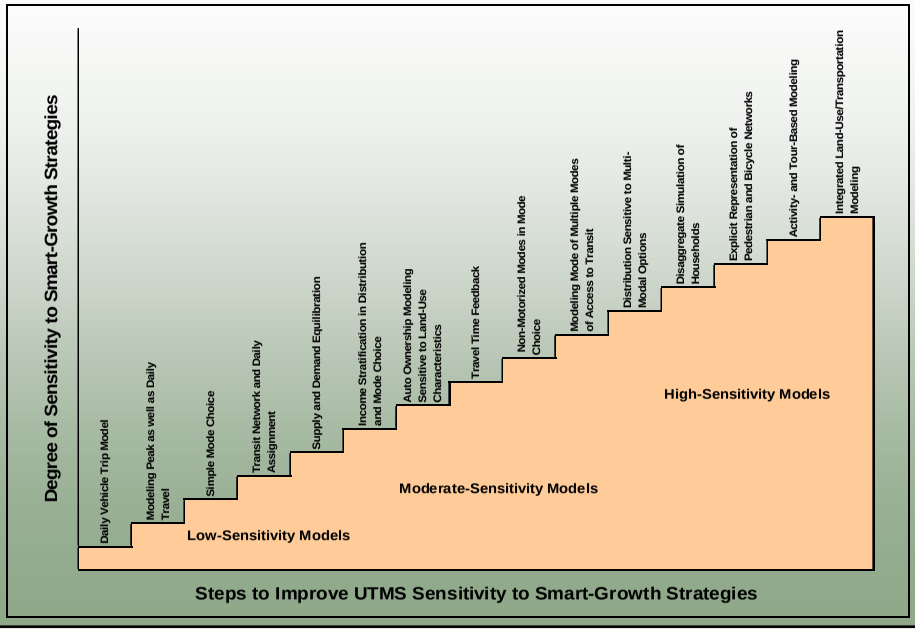
Why Enhanced Models Are Needed – Part 2

- Validation of estimates, such as traffic volumes, fuel sales monitoring
- Need to consider funding constraints, revenue generation
- Different strategy contexts for different MPO's
- Advantages of developing strategies through sensitivity testing
- SB375 requirement for improved modeling

Context for Model Improvements Program

- CTC RTP Guidelines for AB32, four levels of recommendation based on
  - Regional growth rate
  - Congestion levels, AQ attainment
  - Present or planned significant transit, transit use
  - Planned roadway construction
- Caltrans 2007 Recommendations on Modeling Tools
- New research findings on MXD, TOD, Infill, 4D Meta
- 4D development studies in many regions

Caltrans Study "12-Step" Program



Factors with Quantifiable Effects on VMT, CO_2

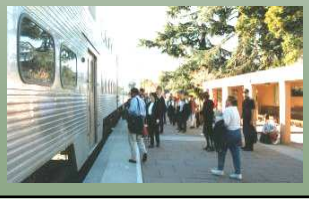
Land Use - Demand Side

- Density
- Diversity
- Design
- Destination Accessibility
- Distance to Transit
- Development Scale
- Demographics
- Demand Management

Transportation - Supply

- Highway Lane Miles
- Transit Revenue Miles
- Induced Travel
- Pricing
- Network Management





Suggested SB375 Model Improvement Program

Step	Method
Develop draft target-setting scenarios	BMP Scorecards
Test draft target-setting scenarios	SST*
Improved models for next RTP	1st Stage Model Upgrades
Better models for subsequent RTP	2nd Stage Model Upgrades

* **SST: simplified, standardized tool for evaluating the combined effects of BMPs while accounting for regional differences.**

Suggested SB375 Model Improvement Schedule

Dec. 2009	Develop BMP Scorecards Set Model Performance Standards
March 2010 June 2010	Develop and Apply SST* Model Diagnostics, Improvement Plan
Dec. 2010	1st Stage Model Upgrades
2011 - 2014	2nd Stage Model Upgrades

*** SST: simplified, standardized tool for evaluating the combined effects of BMPs while accounting for regional differences.**

BMP Scorecards (2009)

Dec. 2009	**Develop BMP Scorecards** Model Performance Standards
March 2010* June 2010	Develop and Apply SST** Model Tests, Improvement Plan
Dec. 2010	1st Stage Model Upgrades
2011 - 2014	2nd Stage Model Upgrades

- List of measures
- Prerequisite conditions
- Range of effectiveness*
- Interdependencies*
- Performance standards for SST
- Gateway to more thorough analysis

* **Informed by expert panel**

Set Model Performance Standards (2009)

Dec. 2009	Develop BMP Scorecards **Model Performance Standards**
March 2010* June 2010	Develop and Apply SST** Model Tests, Improvement Plan
Dec. 2010	1st Stage Model Upgrades
2011 - 2014	2nd Stage Model Upgrades

- Accuracy standards*
- Validation standards*
- Consistency standards
- Transparency
- Stability: “noise” reduction measures
- Model sensitivity (e.g. BMP effectiveness ratings)**

* **Guidelines set by Caltrans, FHWA and FTA**

** **Criteria informed by expert panel**

Develop and Apply SST (2009-2010)

Dec. 2009	Develop BMP Scorecards Model Performance Standards
March 2010* June 2010	**Develop and Apply SST**** Model Tests, Improvement Plan
Dec. 2010	1st Stage Model Upgrades
2011 - 2014	2nd Stage Model Upgrades

- Translate BMP criteria and effectiveness ratings into factors for SST
- Develop and validate SST, a simplified, standardized, spreadsheet tool for evaluating interactions among BMPs (e.g. iPLACE3S, Envision, UPLAN)
- Apply SST in scenario testing and target setting

*** SST: simplified, standardized tool for evaluating the combined effects of BMPs while accounting for regional differences.**

Perform Model Diagnostics (2009-2010)

Dec. 2009	Develop BMP Scorecards Model Performance Standards
March 2010* June 2010	Develop and Apply SST** **Model Tests, Improvement Plan**
Dec. 2010	1st Stage Model Upgrades
2011 - 2014	2nd Stage Model Upgrades

- Assess model ability to meet performance standards for accuracy, sensitivity, stability, consistency*
- Develop improvement plan for Stage 1 model upgrades
- Peer review process
- Possible outside support, Prop 84 funding

* Including assumptions on fuel price, vehicle fuel economy

Stage 1 Model Upgrades (2010)

Dec. 2009	Develop BMP Scorecards Model Performance Standards
March 2010* June 2010	Develop and Apply SST** Model Tests, Improvement Plan
Dec. 2010	**1st Stage Model Upgrades**
2011 - 2014	2nd Stage Model Upgrades

- Address findings of model testing, through in-stream or post-process elasticities and 4D adjustments
- For scenario development, parcel-level visioning interface (eg SCAG Envision, i-PLACE3S, UPLAN)
- Use standard reporting template, listing:
  - o Land use and transport strategies employed
  - o Expected results*, actual results, reasons for differences
- Calibrate estimates of VMT, trip generation, speeds to empirical data*

*Based on criteria set by FHWA, FTA and Caltrans, and expert panel. Possible additional support, Prop 84 funding

Stage 2 Model Upgrades (2011-2014)

Dec. 2009	Develop BMP Scorecards Model Performance Standards
March 2010* June 2010	Develop and Apply SST** Model Tests, Improvement Plan
Dec. 2010	1st Stage Model Upgrades
2011 - 2014	**2nd Stage Model Upgrades**

- Activity-based models or equivalent in largest regions
- 4-step models in regions with transit and TDM
- Sensitive to all strategies included in SCS / APS:
  - Demand-side "Ds"
  - Supply-side: ITS and TSM, dynamic speed and delay, induced travel
  - Pricing
- Validate GHG estimates versus odometer or fuel purchase data
- Vehicle ownership model, fuel consumption
- Continued monitoring of fuel and VMT odometer data for future model refinement and recalibration
- Establish State service bureau for sharing data, innovations and standardized methods, possible Prop 84 funding

Blueprint Scenarios as a Basis for Assessing Regional Targets

- Roles of BMPs and Models
- Blueprints as a Basis for Setting Targets
- Accounting for Regional Differences
- Equity and Degrees of Difficulty
- Remaining Questions

Scenarios Represent Full Range of Strategies

- Land use compactness:
  infill/TOD, density, mix, connectivity
- Land use plus ambitious transit spending
- Land use plus parking/road pricing
- Land use plus transit plus pricing

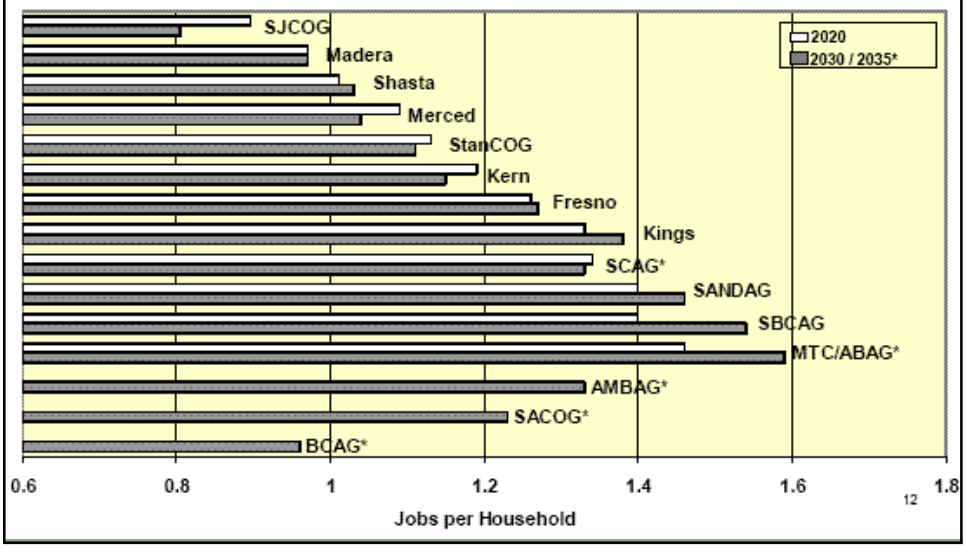
Regional Differences -- Uncontrollable

- Growth rate
- Socio-economics
- Land value
- Committed development projects
- Committed transportation expenditures
- Legacy land patterns and infrastructure

Regional Differences – Other GHG Precursors

- Job/ housing balance
- Total transportation expenditures
- Proportion of transportation expenditures for roads vs transit and non-motorized
- Relative amounts of highway lane miles, transit revenue miles, and mode choice
- Pricing strategies
- Development density, diversity, design
- Percent infill vs greenfield

Jobs per Household Data



Effects of RTP Land Use on CO_2

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- Regions with high growth rates (> 1.7% per year) project per capita CO2 changes of 8% or more *(up or down)*
- Regions with low growth rates (<1.0% annually) project changes in per capita CO2 of less than 2% *(up or down)*
- Regions with good jobs/housing balance (between 1.1 and 1.4) project stable or decreasing per capita CO2,
- Those with poor balance project an increase in CO2 per capita.
- High-growth regions expanding at low densities (<1 person per acre) increased per capita CO2 at a substantially greater rate than those growing at higher densities (>1.5 per acre).

GHG Effects of Land Use and Transit: 4 - 7%

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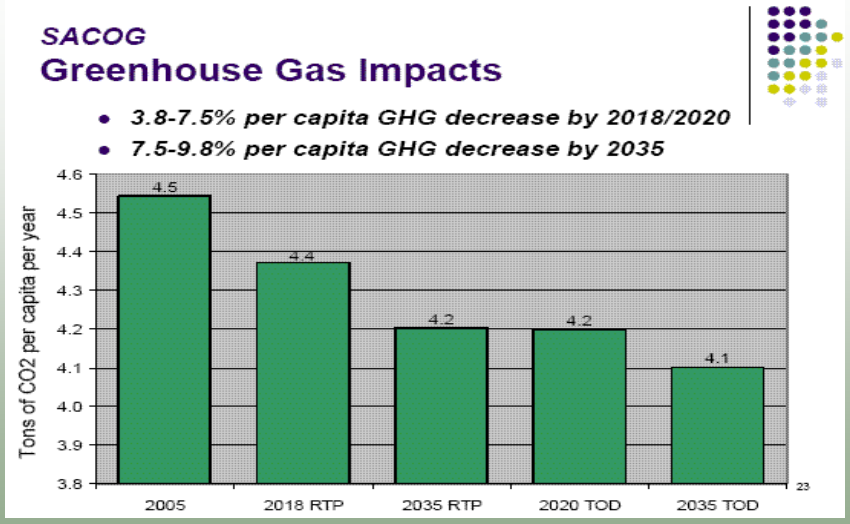

Notes: Includes almost doubling transit funding per capita
Excludes pricing and most aggressive land use goals

GHG Effects of Pricing and Land Use: 8 – 10%

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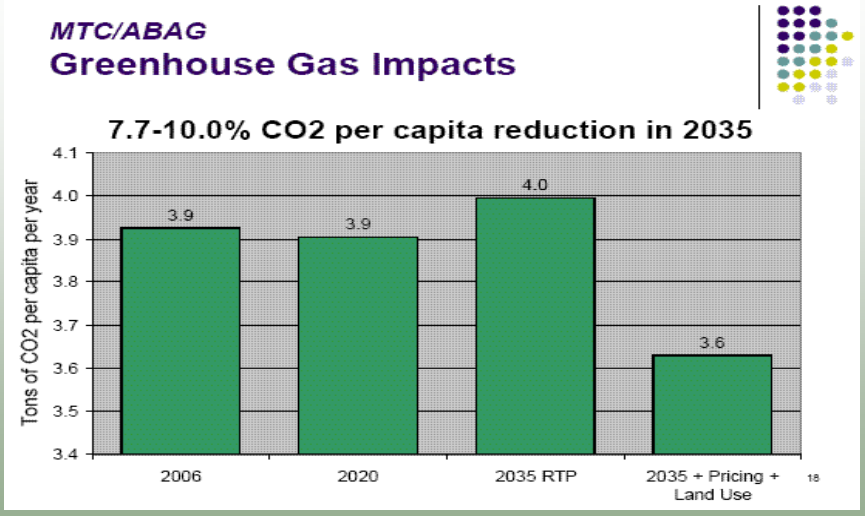

Includes carbon tax, congestion pricing, 20% increase in fuel cost, parking cost
Excludes model sensitivity, most aggressive land use strategy

GHG Effects of Smart Growth Land Use: 5%

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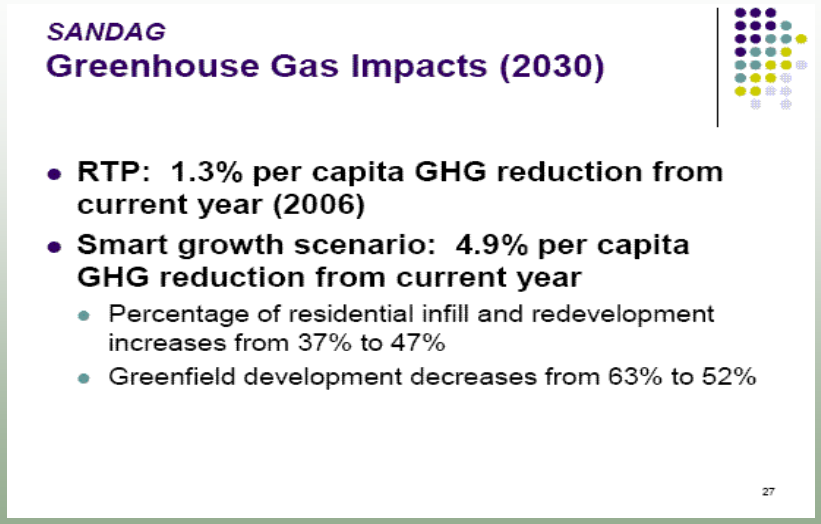

Includes expanded but not comprehensive pricing

Excludes model sensitivity

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Setting Targets that Account for Regional Differences

- Roles of BMPs and Models
- Blueprints as a Basis for Setting Targets
- Accounting for Regional Differences
- Equity and Degrees of Difficulty
- Remaining Questions

Methodology for Setting Targets: Best-Practices vs Game-Changers

Land Use
Transport, TDM
Pricing

- Consider variations among regions:
  - Different growth rates
  - Historic land use patterns, land value, job/housing ratio
  - Historic transportation investments
  - Readiness and critical mass for major policy shifts

Methodology for Setting Targets: Land Use Similarities and Differences

Land Use
Transport, TDM
Pricing, Tech

- Daily VMT/capita varies from about 15 to 25, with the 4 largest MPO's clustered near statewide average of 20
- Population growth rate to 2020 is 10% to 15% in coastal regions, and 20% to 40% in Valley, but
- For areas of similar size, number of new residents added by 2020 is similar (400 to 600k) in each of: SANDAG, SACOG, Bay Area, 3 sub-regions of SJ Valley, 4 to 6 SCAG sub-regions

Methodology for Setting Targets: Strategies for Mature vs Growth Regions

Land Use
Transport, TDM
Pricing, Tech

- Target regional accountability for <u>future</u> decisions, D's and location-efficiency for new development, e.g.:
  - SCAG, SANDAG, Bay Area: focus growth at infill opportunity sites
  - Valley: create communities with density, mix, connected design, neighborhood schools and services, suite of transport options

Methodology for Setting Targets: Transportation Similarities and Differences

Land Use
Transport, TDM
Pricing, Tech

- Percentage of recent transportation investment in roads versus transit and non-motorized modes
- Readiness for pricing: SCAG, SANDAG, Bay Area

Levels of Ambition (largest MPO's)

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Wide range even among large MPOs

		MPO 2035 Plans		2035 Scenarios	
		RTP Range	RTP Avg	Range	Average
Compact, Infill Development	Compact % of Housing Growth	15% - 73%	**52%**	49% - 79%	**59%**
	Infill % of Housing Growth	27% - 49%	**34%**	47% - 62%	**58%**
Transit Expenditure Rate Increase	% of Expenditures on Non-Roads	19% - 73%			
	Reduction in Lane Miles / Capita	16% - 35%	**19%**		**24%**
Auto Operating Cost Increase	Increase in Auto Operating Cost	0% - 56%	**34%**	0% - 88%	**74%**

Levels of Ambition (largest MPO's)

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Scenarios increase infill and pricing

		MPO 2035 Plans		2035 Scenarios	
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Other Opinions on Ambitious Strategies

Strategy	Expert Opinions on Scenario Criteria			
	Status Quo	More Aggressive	Max Effort	
Compact, Infill Development	50%	75%	90%	Randall Lewis, Chris Nelson, ULI Moving Cooler
Transit Expenditure Rate Increase	50%	100%	300%	+ High Speed Rail, HOV lanes, TDM
Auto Operating Cost Increase	50%	70%	150%	+ Cordon, Congestion, Parking Pricing

Ambitious Enough?

Strategy		MPO 2035 Plans	2035 Scenarios	Experts
Compact, Infill Development	Compact % of Housing Growth	**52%**	**59%**	**70%-90%**
	Infill % of Housing Growth	**34%**	**58%**	
Transit Expenditure Rate Increase	% of Expenditures on Non-Roads			**100%-300% +**
	Reduction in Lane Miles / Capita	**19%**	**24%**	
Auto Operating Cost Increase	Increase in Auto Operating Cost	**34%**	**74%**	**70% - 150% +**

Ambitious but Achievable
Equity and Degrees of Difficulty

- Roles of BMPs and Models
- Blueprints as a Basis for Setting Targets
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- Equity and Degrees of Difficulty
- Remaining Questions

Sample Template for Reporting Scenario Strategies

Strategy*	Ambitious/ Achievable Change from Base**	Level in Scenario	Justification for Scenario Level	Expected Benefit** VMT/ capita	Benefit Range ***
Growth at Infill Locations	**70%** ⟷ **50%**		**x% of infill sites remedial**	**15%**	**10% - 25%**
Density of Growth Increment	**60%** ⟷ **70%**		**Market conditions xyz**	**5%**	**3% - 10%**
Diversity of Growth Increment	**80%**	**80%**	**n/a**	**5%**	**2% - 12%**

* Specific measures that may reinforce or amplify measures in the list include parking cash-out, parking maxima, unbundled parking, PAYD, TDM coordinator, transportation information programs. Some of these supporting measures are necessary though possibly not sufficient to achieve significant benefit.

** Final values to be provided by expert panel

*** Range varies by: region size, growth rate, demographics, prior investment in transit, interaction with complementary and compromising measures included in strategy, and critical mass factors.

Sample Template for Reporting Scenario Strategies

	Strategy*	Ambitious/ Achievable Change from Base*
1	Growth at Infill Locations	70%
2	Density of Growth Increment	60%
3	Diversity of Growth Increment	80%
4	% of Growth within ½ mile of Rail/BRT	20%
5	Context Sensitive Design, Connectivity Stds	90%
6	Transit Revenue Miles per Capita	50%
7	Transit Trips Subsidized	20%
8	Jobs Subjected to Paid Parking	15%
9	VMT Tolled	10%
10	Neighborhood Schools, Safe Routes	50%

* Percentages are hypothetical, not recommendations

Greater Responsibility for High Growth Regions?

Should regions that are growing faster have to reduce their VMT at a faster rate?

	2005 VMT/Capita	Growth to 2035	% Rate Reduction	Target VMT/Capita	Rate Reduction	
Uniform VMT Rate Reduction 10% Based on Total Population	20	30%	10%	18.0	2.0	100%
	20	75%	10%	18.0	2.0	
	15	30%	10%	13.5	1.5	60%
	25	75%	10%	22.5	2.5	
Unfirom VMT Rate Reduction 20% of Growth Increment	20	30%	5%	19.1	0.9	54%
	20	75%	9%	18.3	1.7	
	15	30%	5%	14.3	0.7	32%
	25	75%	9%	22.9	2.1	

Greater Responsibility for High Growth Regions?

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	25	75%	9%	22.9	2.1	

If reduction is based only on growth increment, fast growth regions could have twice as much responsibility to reduce VMT/ capita as slower growth regions.

Greater Responsibility for High Growth Regions?

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	25	75%	9%	22.9	2.1	

Regions with lower starting VMT per capita would have lower trip rate reduction requirements regardless of respective growth rates.

Credit for Prior Accomplishments?

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Should regions whose base-year VMT is higher have to reduce at a faster rate?

	2005 VMT/Capita	Growth to 2035	% Rate Reduction	Target VMT/Capita	Rate Reduction	
Unfirom VMT Rate Reduction 20% of Growth Increment	20	30%	5%	19.1	0.9	54%
	20	75%	9%	18.3	1.7	
	15	30%	5%	14.3	0.7	32%
	25	75%	9%	22.9	2.1	
Accelerated Rate Reduction for High Generators: 40% of Rate over Practical Min	15	30%	3%	14.5	0.5	18%
	25	75%	10%	22.4	2.6	
	15	50%	4%	14.3	0.7	33%
	25	50%	8%	23.0	2.0	

Region closer to practical min of 10 VMT/Capita would have to reduce at **1/3** the rate

Credit for Prior Accomplishments?

Should regions whose base-year VMT is higher have to reduce at a faster rate?

	2005 VMT/Capita	Growth to 2035	% Rate Reduction	Target VMT/Capita	Rate Reduction	
Unfirom VMT Rate Reduction 20% of Growth Increment	20	30%	5%	19.1	0.9	54%
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Accelerated Rate Reduction for High Generators: 40% of Rate over Practical Min	15	30%	3%	14.5	0.5	18%
	25	75%	10%	22.4	2.6	
	15	50%	4%	14.3	0.7	33%
	25	50%	8%	23.0	2.0	

Slow-growth region closer to practical min would have to reduce at **less than 1/5** rate

Addressing Equity Issues – Part 1

- Requiring same GHG/capita of existing and new development (both as a % reduction in existing regional average):
  - avoids shifting economic burden from one region to another,
  - reduces risk of excessive burden on land price and development cost in rapidly growing regions
- Encouraging compact sustainable development for both infill and greenfields brings economic benefits to communities and households of different socio-economic groups

Addressing Equity Issues – Part 2

- Targets based on both population and employment assure that regions don't benefit unfairly from accommodating jobs and retail without housing
- Alternative approach: assign regions with excess jobs or retail responsibility for ½ of the GHG associated with the interregional trips they attract
- Consider not only balance of jobs and housing but socio-economic match

Remaining Questions

- **Roles of BMPs and Models**
- **Blueprints as a Basis for Setting Targets**
- **Accounting for Regional Differences**
- **Equity and Degrees of Difficulty**
- **Remaining Questions**

Remaining Questions

- Do RTP and Blueprint studies performed to date provide sufficient evidence of ambitious but achievable percent reductions?
- In what time frame should pricing strategies be required?
- Unresolved equity issues?
- Are target-setting methods and models scalable, to allow local jurisdictions to refine their land-use transportation strategies in a manner consistent with regional evaluation?